Patent Abstracts of Japan

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INVENTOR : TANAKA SHINGO;

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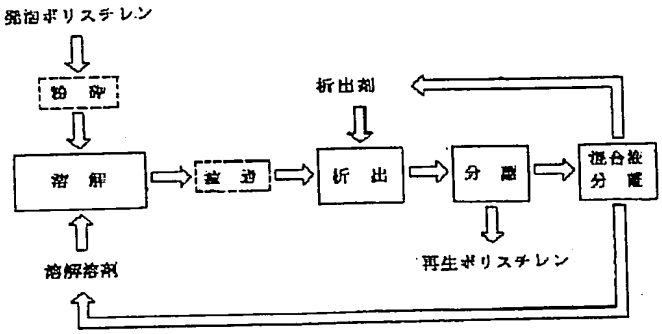
TITLE : VOLUME REDUCTION METHOD AND RECYCLING METHOD FOR FOAMED POLYSTYRENE



ABSTRACT : PROBLEM TO BE SOLVED: To provide a method for reducing the volume of foamed polystyrene which poses a problem of work environment involved in methods using d-limonene, can reduce the volume of foamed polystyrene through dissolution of foamed polystyrene in a solvent in an easy and stable manner, and offers low running cost by virtue of low unit price of the solvent, and to provide a method for recycling foamed polystyrene.

SOLUTION: This method for reducing the volume of foamed polystyrene comprises dissolving foamed polystyrene in a dissolution solvent selected from the group consisting of glycol ether acetic ester compds., glycol ether compds., acetyl acetone, diethyl carbonate, and ethyl orthoformate. The method for recycling foamed polystyrene comprises: adding a lower alcohol as a precipitant to the above soln. to precipitate polystyrene; separating the polystyrene precipitate, for reuse, from the mixed liq. composed of the solvent and the precipitant; separating the residual mixed liq. by distillation into the solvent and the precipitant which are then reused.

PATENT ABSTRACTS OF JAPAN

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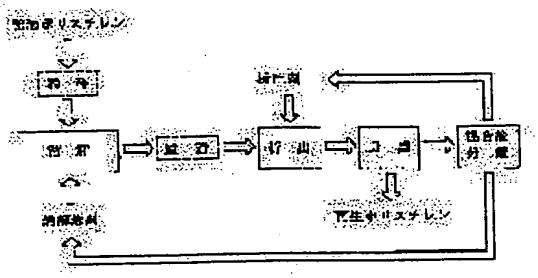
(71)Applicant : **HITACHI ZOSEN CORP**

(72)Inventor : **TANAKA SHINGO**

(54) VOLUME REDUCTION METHOD AND RECYCLING METHOD FOR FOAMED POLYSTYRENE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method for reducing the volume of foamed polystyrene which poses a problem of work environment involved in methods using d- limonene, can reduce the volume of foamed polystyrene through dissolution of foamed polystyrene in a solvent in an easy and stable manner, and offers low running cost by virtue of low unit price of the solvent, and to provide a method for recycling foamed polystyrene.



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LEGAL STATUS

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[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

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[Date of extinction of right]

CLAIMS

[Claim(s)]

[Claim 1] The reduction-ized approach of the form polystyrene characterized by dissolving form polystyrene in the dissolution solvent chosen from the group which consists of a glycol ether acetic-ester system compound, a glycol ether system compound, an acetylacetone, diethyl carbonate, and ethyl orthoformate.

[Claim 2] Form polystyrene A glycol ether acetic-ester system compound, a glycol ether system compound, It dissolves in the dissolution solvent chosen from the group which consists of an acetylacetone, diethyl carbonate, and ethyl orthoformate. Add lower alcohol to this solution as a deposit agent, and polystyrene is deposited. The recycle approach of the form polystyrene characterized by separating a polystyrene sludge from the mixed liquor which consists of the above-mentioned solvent and a deposit agent, and for distillation separating into the above-mentioned solvent and a deposit agent the mixed liquor which offered and remained in reuse, and presenting reuse with these, respectively.

[Claim 3] The recycle approach according to claim 1 or 2 that a glycol ether acetic-ester system compound is ethylene-glycol-monomethyl-ether acetic ester, ethylene-glycol-monoethyl-ether acetic ester, ethylene glycol mono-n-butyl ether acetic ester, diethylene-glycol-monoethyl-ether acetic ester, or diethylene-glycol mono-n-butyl ether acetic ester.

[Claim 4] The recycle approach according to claim 1 or 2 that a glycol ether system compound is ethylene glycol wood ether, ethylene glycol diethylether, diethylene-glycol wood ether, diethylene-glycol diethylether, or diethylene GURIKORUJI n-butyl ether.

[Claim 5] The recycle approach according to claim 1 that lower alcohol is a methanol, ethanol, n-propanol, iso propanol, n-butanol, a sec-butanol, an iso-butanol, n-amyl alcohol, tert-amyl alcohol, n-hexanol, or a sec-hexanol.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the approach of reduction-izing form polystyrene, and the recycle approach with which reduction-ize form polystyrene and reuse is presented.
[0002]
[Description of the Prior Art] In recent years, the recovery approach of the form polystyrene trash by the dissolution considered that deterioration of the physical property of an ingredient is comparatively small is studied. The most general thing as a solvent used for the dissolution of form polystyrene is a d-limonene which is citrus system vegetable essential oil. The conventional recycle approach using d-limonene is shown in drawing 8 .
[0003] d-limonene is excellent in the solubility of form polystyrene. However, this has a problem on work environment, like a citrus smell is strong, and has difficulties, like stability is [that it is easy to decompose from being a natural product] missing.
[0004] Moreover, although the approach by distillation is common in order to separate a solvent and polystyrene, there is a possibility that playback polystyrene may cause deterioration of a physical property with heating at the time of distillation.
[0005] Moreover, the recycle approach of the form polystyrene which uses a glycol ether system compound as a dissolution solvent of form polystyrene is proposed by JP,9-25358,A. Water is used for depositing polystyrene from the solution of polystyrene by this approach. However, about recycle of water, there is no description in this official report in any way. Furthermore, although distillation has separated like d-limonene, the water which remains after a deposit requires big energy, and its distillation of water is very disadvantageous.
[0006]
[Problem(s) to be Solved by the Invention] This invention aims at offering the recycle approach of the form polystyrene trash which can solve many above-mentioned problems by changing the solvent used for the dissolution of form polystyrene.
[0007]
[Means for Solving the Problem] The reduction-ized approach of the form polystyrene by this invention is an approach characterized by dissolving form polystyrene in the dissolution solvent chosen from the group which consists of a glycol ether acetic-ester system compound, a glycol ether system compound, an acetylacetone, diethyl carbonate, and ethyl orthoformate.
[0008] The reduction-ized approach of the form polystyrene by this invention Form polystyrene A glycol ether acetic-ester system compound, a glycol ether system compound, It dissolves in the dissolution solvent chosen from the group which consists of an acetylacetone (CH3 COCH2 COCH3), diethyl carbonate ([C2 H5 O]2 CO), and ethyl orthoformate (HC [OC two H5] 3). Add lower alcohol to this solution as a deposit agent, and polystyrene is deposited. It is the approach characterized by separating a polystyrene sludge from the mixed liquor which consists of the above-mentioned solvent and a deposit agent, and for distillation separating into the above-mentioned solvent and a deposit agent the mixed liquor which offered and remained in reuse, and presenting reuse with these, respectively.
[0009] As the above-mentioned glycol ether acetic-ester system compound Ethylene-glycol-monomethyl-ether acetic ester (CH3 CO2 CH2 CH2 OCH3), Ethylene-glycol-monoethyl-ether acetic ester (CH3 CO2 CH2 CH2 OC two H5), Ethylene glycol mono-n-butyl ether acetic ester (CH3CO2 CH2 CH2 OC four H9), Diethylene-glycol-monoethyl-ether acetic ester (CH3 CO2 CH2 CH2 OCH2 CH2 OC two H5) and diethylene-glycol mono-n-butyl ether acetic ester () [CH3 CO2 CH2] CH2 OCH2 CH2 OC four H9 is illustrated.
[0010] As a glycol ether system compound, ethylene glycol wood ether (CH3 OCH2 CH2 OCH3), Ethylene glycol diethylether (C2 H5 OCH2 CH2 OC two H5), Diethylene-glycol wood ether (CH3 OCH2 CH2 OCH2 CH2 OCH3), Diethylene-glycol diethylether (C2 H5 OCH2 CH2 OCH2 CH2 OC two H5) and diethylene GURIKORUJI n-butyl ether (C4 H9 OCH2 CH2 OCH2 CH2 OC four H9) are illustrated.
[0011] As the above-mentioned deposit agent, lower alcohol, such as a methanol, ethanol, n-

propanol, iso propanol, n-butanol, a sec-butanol, an iso-butanol, n-amyl alcohol, tert-amyl alcohol, n-hexanol, and a sec-hexanol, is independent, or it is used in two or more combination.

[0012]

[Embodiment of the Invention] this invention approach is shown in drawing 1 . Form polystyrene trash is ground if needed and it is made to dissolve in a dissolution solvent by dissolver. After the filtration after dissolving the impurity adhering to form polystyrene trash removes, polystyrene is deposited by adding a deposit agent to a polystyrene solution. Subsequently, a polystyrene sludge is separated from the mixed liquor which consists of the above-mentioned solvent and a deposit agent. Reuse is presented with polystyrene, it is separated into a dissolution solvent and a deposit agent by distillation, and reuse is presented with the mixed liquor which remained, respectively.

[0013] The relation of the concentration and kinematic viscosity of the polystyrene in a dissolution solvent is shown in drawing 2 and drawing 3 . EGEtAc means ethylene-glycol-monoethyl-ether acetic ester among drawing 2 , and EGEt2 means ethylene glycol diethylether among drawing 3 . As for the concentration of polystyrene, also in any, it is desirable to carry out to 15 - 40% of the weight. If concentration exceeds 40 % of the weight, operability may worsen.

[0014] Moreover, the rate of volatilization of the dissolution solvent at the time of the form polystyrene dissolution is shown in drawing 4 . Among drawing, ethylene-glycol-monoethyl-ether acetic ester and EGMeAc mean ethylene-glycol-monomethyl-ether acetic ester, and, as for EGn-BuAc, as for ethylene glycol mono-n-butyl ether acetic ester and EG2EtAc, diethylene-glycol-monoethyl-ether acetic ester and EG2 n-BuAc mean [EGEtAc] diethylene-glycol mono-n-butyl ether acetic ester, respectively. These rates of volatilization do not have great difference so much as compared with it of d-limonene, and it is satisfactory.

[0015]

[Example] Hereafter, although an example explains this invention still more concretely, the range of this invention is not limited to the following examples.

[0016] 5g of example 1 form polystyrene is ground, the grinding object was serially fed into the 100ml beaker of 25g of ethylene-glycol-monoethyl-ether acetic ester into which it went, and the natural dissolution was carried out (16.7 % of the weight of concentration). Form polystyrene was completely dissolved in 8 minutes. The rate of reduction-izing at this time was 1/16, and the kinematic viscosity of a solution was 170 mPa-s. When 20g of methanols was fed into this polystyrene solution and the solution was stirred, polystyrene deposited. Subsequently, the polystyrene sludge was separated from the mixed liquor which consists of ethylene-glycol-monoethyl-ether acetic ester and a methanol by filtering a polystyrene sludge with a paper filter. Reuse was presented with polystyrene, it was separated into a glycol ether acetic-ester system compound and lower alcohol by distillation, and reuse was presented with the mixed liquor which remained, respectively.

[0017] The same actuation as an example 1 was performed except for the point using d-limonene 25g as an example of comparison 1 dissolution solvent. However, the dissolution time amount of form polystyrene was for 17 minutes. A sludge is in the condition of DORODORO and was not able to be filtered with a paper filter.

[0018] 5g of example 2 form polystyrene was supplied to 25g of various dissolution solvents, and dissolution time amount was measured. The result is shown in drawing 5 . EGMeAc, EGEtAc, EGn-BuAc, EG2EtAc, and EG2 n-BuAc are the aforementioned compounds among drawing, respectively. The glycol ether acetic-ester system compound dissolved form polystyrene 1.3 to 2.1 times as quickly as d-limonene.

[0019] 25g of the same actuation as an example 2 was performed except for the point using an acetylacetone, diethyl carbonate, or ethyl orthoformate as an example 3 dissolution solvent, respectively, and dissolution time amount was measured. The result is shown in drawing 6 as compared with d-limonene. Every solvent dissolved form polystyrene more quickly than d-limonene.

[0020] 25g of the same actuation as an example 2 was performed except for the point using ethylene glycol wood ether, ethylene glycol diethylether, diethylene-glycol wood ether, diethylene-glycol diethylether, or diethylene GURIKORUJI n-butyl ether as an example 4 dissolution solvent, respectively, and dissolution time amount was measured. The result is shown in drawing 7 as

compared with d-limonene. the inside of drawing, and EGMe2 -- ethylene glycol wood ether and EGEt2 -- ethylene glycol diethylether -- as for diethylene-glycol wood ether, in EG2Et2, EG2 n-Bu2 means [EG2Me2] diethylene GURIKORUJI n-butyl ether, respectively, as for diethylene-glycol diethylether. The glycol ether system compound dissolved form polystyrene 1.0 to 2.8 times as quickly as d-limonene.

[0021] In addition, in the case of ethylene glycol wood ether, the kinematic viscosity of a solution was 150 mPa-s.

[0022]

[Effect of the Invention] Since a specific organic solvent is used for it as a dissolution solvent, the reduction-ized approach of the form polystyrene trash by this invention does not produce the problem on work environment like the approach using d-limonene, can be dissolved in a solvent easily and stably, and can make form polystyrene reduction-ize, and since the unit price of a solvent is cheaper than d-limonene, moreover, a running cost attaches it at a low price.

[0023] Moreover, since the recycle approach of the form polystyrene trash by this invention adds lower alcohol to the solution which comes to dissolve form polystyrene trash in a dissolution solvent as a deposit agent, it is economical compared with the approach of being able to separate polystyrene from a solution upwards easily and using water as a deposit agent. And since distillation is not needed for separating a solvent and polystyrene, there is no possibility that playback polystyrene may cause deterioration of a physical property with heating at the time of distillation.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the approach of reduction-izing form polystyrene, and the recycle approach with which reduction-ize form polystyrene and reuse is presented.

PRIOR ART

[Description of the Prior Art] In recent years, the recovery approach of the form polystyrene trash by the dissolution considered that deterioration of the physical property of an ingredient is comparatively small is studied. The most general thing as a solvent used for the dissolution of form polystyrene is a d-limonene which is citrus system vegetable essential oil. The conventional recycle approach using d-limonene is shown in drawing 8 .

[0003] d-limonene is excellent in the solubility of form polystyrene. However, this has a problem on work environment, like a citrus smell is strong, and has difficulties, like stability is [that it is easy to decompose from being a natural product] missing.

[0004] Moreover, although the approach by distillation is common in order to separate a solvent and polystyrene, there is a possibility that playback polystyrene may cause deterioration of a physical property with heating at the time of distillation.

[0005] Moreover, the recycle approach of the form polystyrene which uses a glycol ether system compound as a dissolution solvent of form polystyrene is proposed by JP,9-25358,A. Water is used for depositing polystyrene from the solution of polystyrene by this approach. However, about recycle of water, there is no description in this official report in any way. Furthermore, although distillation has separated like d-limonene, the water which remains after a deposit requires big energy, and its distillation of water is very disadvantageous.

EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] This invention aims at offering the recycle approach of the form polystyrene trash which can solve many above-mentioned problems by changing the solvent used for the dissolution of form polystyrene

MEANS

[Means for Solving the Problem] The reduction-ized approach of the form polystyrene by this invention is an approach characterized by dissolving form polystyrene in the dissolution solvent chosen from the group which consists of a glycol ether acetic-ester system compound, a glycol ether system compound, an acetylacetone, diethyl carbonate, and ethyl orthoformate.

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[0021] In addition, in the case of ethylene glycol wood ether, the kinematic viscosity of a solution was 150 mPa-s.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the flow sheet which shows the recycle approach of the form polystyrene by this invention.

[Drawing 2] It is the graph which shows the relation of the concentration and kinematic viscosity of the polystyrene in EGEtAc (ethylene-glycol-monoethyl-ether acetic ester).

[Drawing 3] It is the graph which shows the relation of the concentration and kinematic viscosity of the polystyrene in EGEt2 (ethylene glycol diethylether).

[Drawing 4] It is the graph which shows the relation between various dissolution solvents and the rate of volatilization.

[Drawing 5] It is the graph which shows the relation between various dissolution solvents and dissolution time amount.

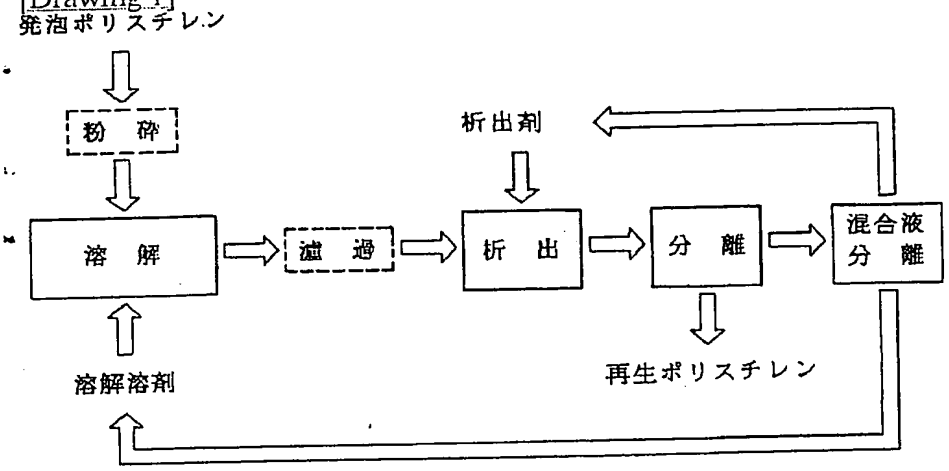
[Drawing 6] It is the graph which shows the relation between various dissolution solvents and dissolution time amount.

[Drawing 7] It is the graph which shows the relation between various dissolution solvents and dissolution time amount.

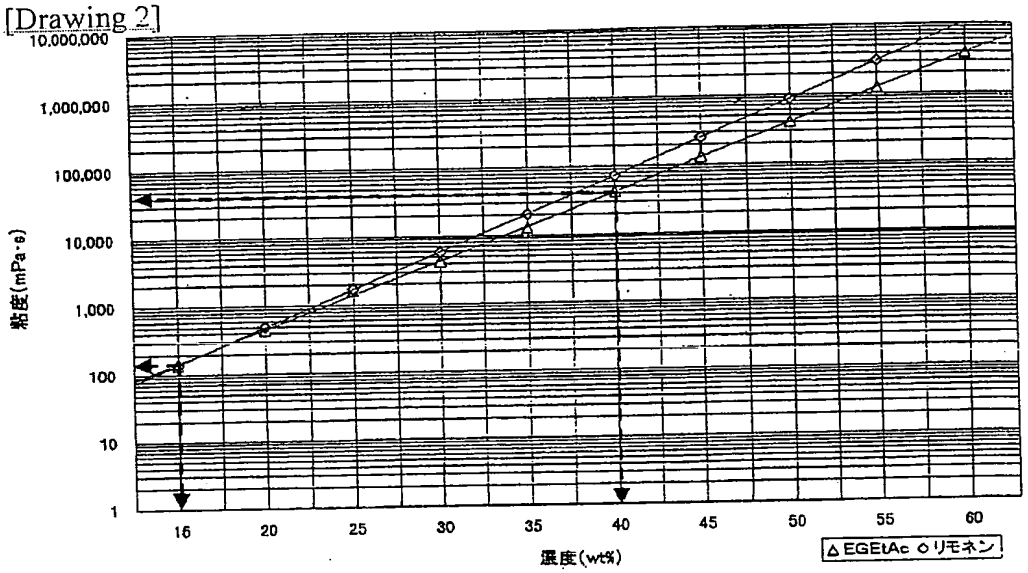
[Drawing 8] It is the flow sheet which showed the recycle approach of conventional form polystyrene.

DRAWINGS

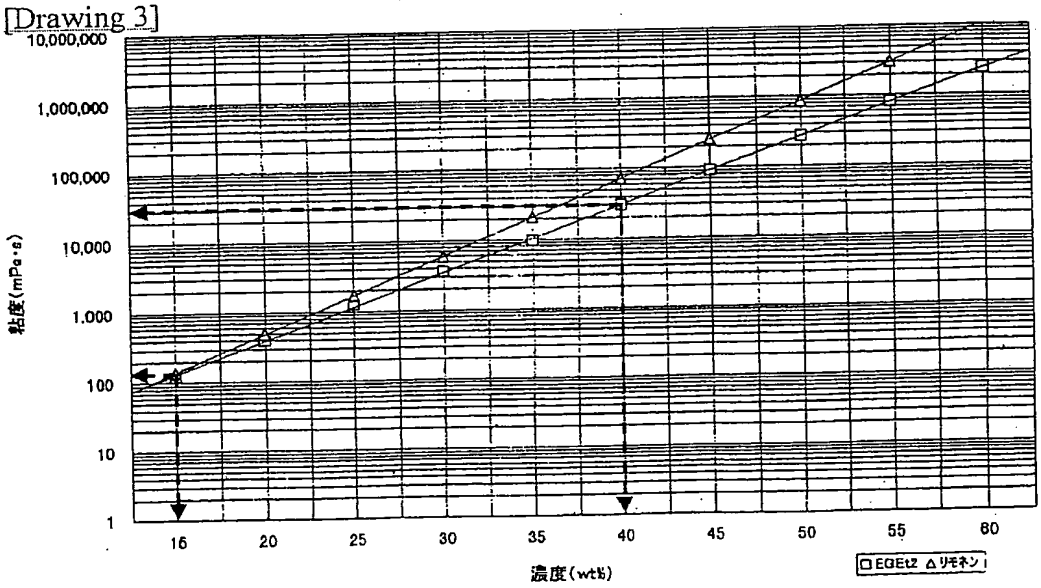
[Drawing 1]



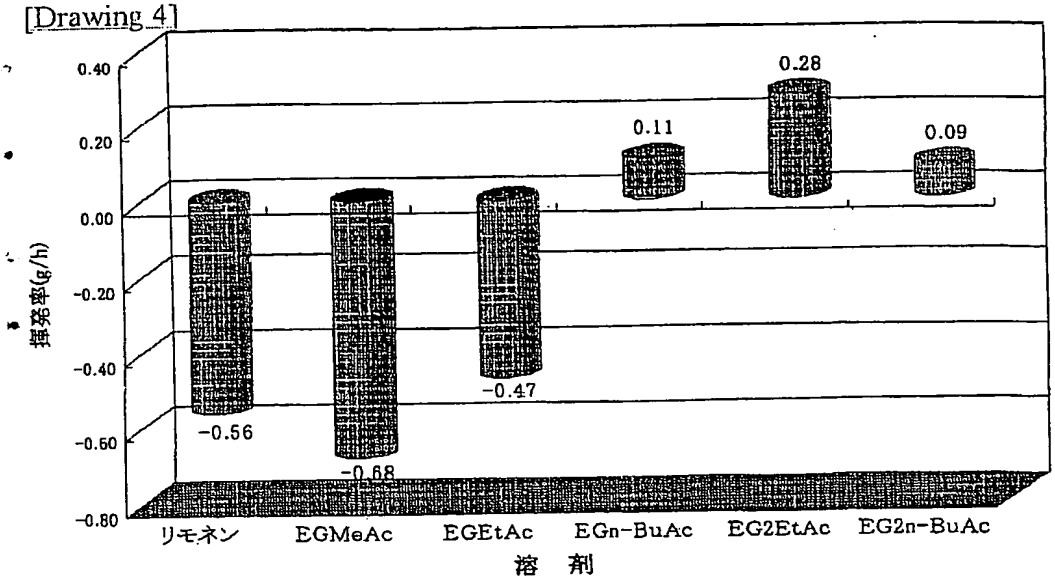
[Drawing 2]



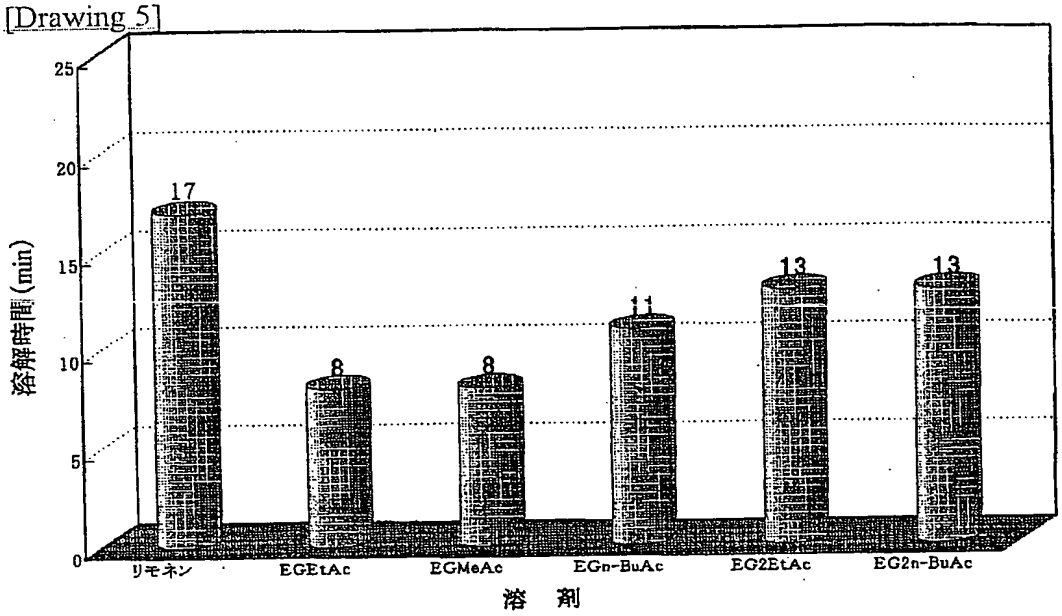
[Drawing 3]



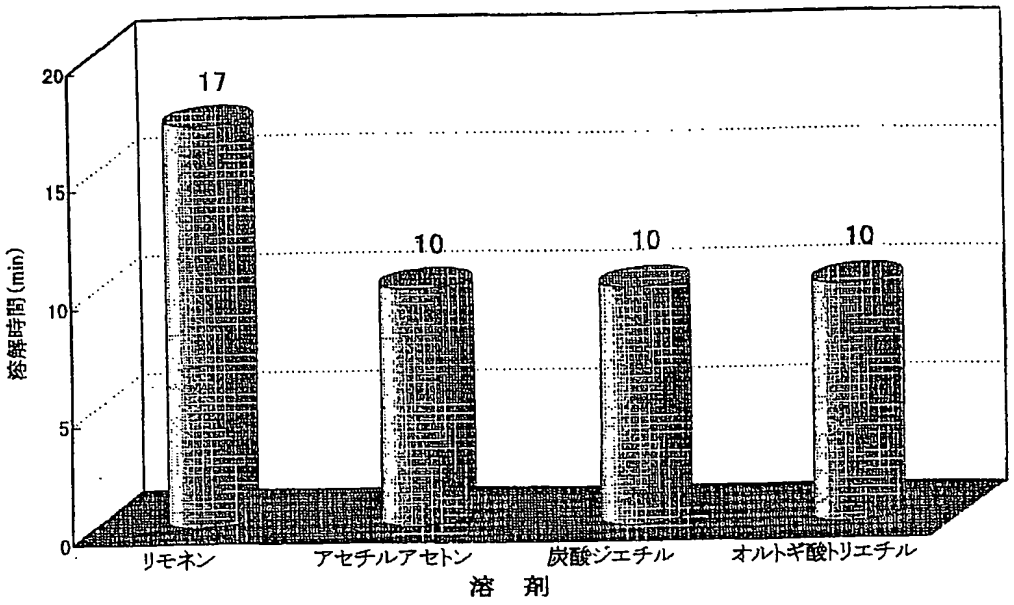
[Drawing 4]



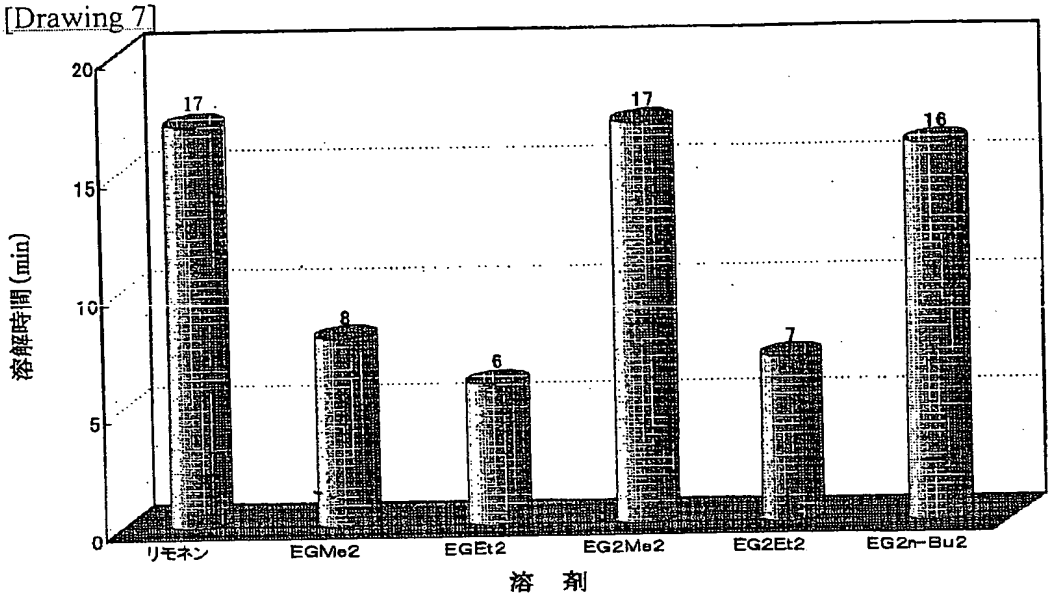
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Drawing 8]